REMARKS/ARGUMENTS

Upon entry of the instant response, claims 24-68 will remain pending. Claims 24, 29, 34, 38, 42, 49, 50, 51, 52, 55, 58, 59 and 62 are independent claims.

Reconsideration and allowance of the application are respectfully requested.

Discussion Of Advisory Action And Indication of Allowable Subject Matter And Remaining Rejections Of Record After Issuance Of Advisory Action

Applicants note that the Advisory Action indicates that:

(a) The rejection of claims 34, 35 and 65-68 over EP 554,908 has been overcome by Applicants' reply.

(b) Claims 23-33, 36-45, 47, 48 and 51-64 are allowed.

(c) Claims 34, 35, 46, 49, 50 and 65-68 are rejected.

Still further, while not specifically indicated in the Advisory Action, Applicants' reply should also have overcome the 35 U.S.C. 112, second paragraph, rejection. Therefore, in the absence of further repetition of the indefiniteness rejection, Applicants' will treat the rejection as having been withdrawn.

Accordingly, the following rejections remain of record after the issuance of the Advisory Action:

(a) Claims 34, 35 , 49, 50 and 65-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 294,208 (hereinafter "EP '208").

(b) Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Katoh, U.S. Patent No. 5,925,592

Applicants respectfully submit that each of the pending claims is in condition for allowance for the reasons that will be discussed below, and an early mailing of the Notices of Allowance and Allowability is respectfully requested.

Discussion Of Telephone Interview With Examiner

Applicants express appreciation for the courtesies extended by the Examiner during a March 18, 2004 telephone interview with Applicants' representative wherein the Final Office Action and Advisory Action were discussed. In particular, the rejections remaining of record were discussed with the Examiner, which rejections include the rejections based upon EP '208 and Katoh. Differences between the disclosures of these documents with respect to Applicants' disclosed and claimed invention were discussed, and the Examiner indicated that he would reconsider Applicants application upon resubmission of a written response including arguments relating to the rejections remaining of record. Moreover, the Examiner indicated that he would contact Applicants' if he deemed that an Examiner's Amendment would be applicable to place the application into condition for allowance.

The arguments presented during the interview are included in the arguments presented herein.

Response To Rejection Under 35 U.S.C. 112, Second Paragraph

As noted above, it appears that the rejection of claims 25 and 30 under 35 U.S.C. 112, second paragraph, as being indefinite should no longer be applicable upon entry of the Amendment

Under 37 C.F.R. 1.116, filed January 29, 2004. Accordingly, this ground of rejection should be withdrawn.

Response To Rejections Based Upon Prior Art

Rejection of claims 34, 35 , 49, 50 and 65-68 under 35 U.S.C. 103(a) as being unpatentable over EP 294,208 (hereinafter "EP '208").

Applicants again note prior to discussing the merits of the rejection that U.S. Patent Nos. 4,954,462 and 5,185,299 (which are cited in Applicants' Information Disclosure Statement) are family members of EP '208.

As discussed with the Examiner during the above-noted telephone interview, in contrast to Applicants' disclosed and claimed invention, EP '208 is directed to the disclosure of the microstructure of the powders that can be formed. The disclosure of grain size in EP '208 is directed to the microcystallites and the grains within larger materials. Thus, the parameters set forth in EP '208 relate to the grains and microcrystallites, and not to the size of powders. EP '208 does not appear to provide any teaching or suggestion of powders according to Applicants' disclosed and claimed invention. The powders disclosed in EP '208 appear to be **powders formed including grains**, and the size of the grains are disclosed in EP '208. The **powders in EP '208 should have sizes greater than the grains**, and therefore would have sizes of particles that are much larger than those that are recited in Applicants' claims. Therefore, fine and small powders as disclosed by EP '208 would not include powders as recited in Applicants' claims. Moreover, fine and small powders would have sizes much greater than powders recited by Applicants,

whereby there is no teaching or suggestion in EP '208 to arrive at powders as recited in Applicants' claims.

For example, attention is once again directed to Example 2 of EP '208 which discloses specimens of beads having a diameter of about 150 micrometers, with the surface of the beads consisting of 0.1-0.4 micrometer crystallites with an average grain size of about 0.3 micrometer. Thus, one having ordinary skill in the art reviewing the disclosure of EP '208 would readily recognize that the materials disclosed therein would have sizes distinct from nanocorundum powders recited in Applicants' claims. For example, with respect to Applicants' independent claim 34, Applicants note that it is directed to nanocorundum powders comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles $D_{84} < 150$ nm, less than 0.05% by weight chlorine, at least 60% α-aluminum oxide, and the powders are redispersible.

Moreover attention is once again directed to EP '208 at page 3, lines 57-58, where average crystallite size is disclosed, and page 10, last three lines, wherein fibers were found to be composed of 0.2-0.5 micrometer alpha alumina grains with an average grain size of about 0.25 micrometers. However, the fibers would have a larger size than the average grain size.

Accordingly, EP '208 is directed to materials having a certain microstructure, and this is not the particles recited in Applicants' claims. In particular, the "articles" disclosed by EP '208 are fired materials with an inner microstructure such as recited in claim 1 of EP '208. These articles do not comprise powders as recited by Applicants.

To further emphasize the differences between Applicants' invention and that disclosed in EP '208, Applicants direct the Examiner's attention to the following documents, including patent documents of Minnesota Mining and Manufacturing Company (hereinafter "3M") which is the Applicant of EP '208. In particular, Applicants refer to Pistoia et al., as well as WO 94/14722 and its family members U.S. Patent Nos. 5,690,707 and 5,871,555[1]. As can be seen from a review of these documents, powders of 3M are abrasive powders. In this regard, attention is directed to EP '208, page 2, lines 47 and 48, which discloses application to ceramic fibers as well as to fine structured alpha alumina of high density as a superior abrasive. Moreover, attention is directed to Pistoia et al., wherein use of abrasive powder of the 3M finishing and polishing sandpaper is disclosed in the Abstract.

Moreover, a review of the attached WO 94/14722 and its U.S. family members show how abrasive grains of this kind of "powder" look when embedded on sandpaper, as illustrated in Fig. 1 of WO 94/14722. Fig. 4 of WO 94/14722 shows that the crystals shown by Fig. 4 are really slightly smaller than one half of the 1 μm bar, i.e., slightly smaller than 500 nm, whereas, the size of the abrasive grains is usually > 100 μm.

To the contrary, claim 34 of the present application recites nanocorundum powders comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles $D_{84} < 150$ nm, less than 0.05% by weight chlorine, at

1 The documents are being submitted in accordance with MPEP 609(C)(3) as part of Applicants' reply to the Office Action in support of an argument so that the requirements of 37 C.F.R. 1.97 and 1.98 need not be met, and the information is being submitted as part of the record with the reply for the Examiner's consideration with Applicants' reply.

least 60% α-aluminum oxide, and the powders are redispersible. Here, the powders do not comprise larger grains > 100 μm with an inner microstructure but is composed of redispersible individual particles much smaller than 150 nm in that about 85% are smaller than 150 nm, which is orders of magnitude smaller than abrasive powders that are capable of being produced by processes as disclosed in EP '208. Applicants' processes achieve powders that do not comprise an inner structure of crystallites. The claim 34 particles of Applicants' invention exclude any form of agglomeration or aggregation of the particles in that the powders are redispersible, which is different from fired structures disclosed and claimed by EP '208.

The Advisory Action relies upon disclosure of EP '208 that the powders thereof can be fine and small sized, referring to page 8, line 41, and page 10, line 4, and that it is the Examiner's position that the broad recitation of fine or small is within the scope of the claimed size absent clear evidence to the contrary. In response, Applicants refer the Examiner to the above arguments, and especially refer the Examiner once again to Example 2 of EP '208. Certainly, this Example supports the position that the articles of EP '208, such as powders are formed of crystallites and grains, and the articles/powders have sizes, such as 150 micrometers in Example 2, which are distinct from Applicants' disclosed and claimed invention. Therefore, while EP '208 discloses grains having an average grain size of less than about 0.5 micrometer, and an average grain size of about 0.2 – 0.3, such as at page 2, lines 60-62 and page 4, lines 45-50, EP '208 does not teach or suggest redispersible nanocorundum powders comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles D_{84} < 150 nm, less than 0.05% by weight chlorine, and at least 60% α-aluminum oxide.

Still further, Applicants' note that the articles of EP '208 are solid, shaped and fired refractory articles, such as recited in claim 1 thereof, and that these fired refractory articles comprise powders, such as recited in claim 5. As noted above, these fired articles would have sizes orders of magnitude larger than that included in Applicants' claims.

Accordingly, claim 34 and its dependent claim 35 are patentable over EP '208, and the rejection should be withdrawn.

Still further, Applicants' claim 49 is directed to dense sinter corundum layers consisting essentially of Al_2O_3 on a substrate produced by a process for producing redispersible nanocorundum with an average particle size $D_{50} < 100$ nm with addition of nuclei that promote transformation to corundum in subsequent annealing, which process comprises:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, chlorine-free inorganic precursors;

(b) hydrolyzing the solution or the sol of (a) through the addition of a base in a mole ratio of base:precursor of 1 to 3;

(c) aging the hydrolyzed solution or sol of (b) at temperatures between 60 and 98°C for 1 to 72 hours;

(d) applying the aged hydrolyzed solution or sol of (c) to a substrate;

(e) subsequently drying the applied aged solution or sol of (d) followed by calcination at temperatures between 350 and 650°C for converting hydrolyzed precursor into a semiamorphous intermediate phase and ultimately into transitional aluminum oxides; and

(f) performing annealing by increasing temperature to $\leq$ 950°C for converting product of (e) into corundum phase,

wherein the substrate is composed of a different material from the corundum layers, and in which through sintering at a temperature of $\leq$ 1250°C there is an average grain size of $\leq$ 0.5 μm.

Applicants' claim 50 is directed to dense sinter corundum layers consisting essentially of Al_2O_3 on a substrate produced by a process for the production of sintered porous or dense corundum layers on a substrate by a process for producing redispersible nanocorundum with an average particle size D_{50} < 100 nm with addition of nuclei that promote transformation to corundum in subsequent annealing, which process comprises:

(a) dissolving in a liquid medium or processing in a liquid medium to a sol, as starting materials, organic precursors;

(b) hydrolyzing either (i) with excess water through addition of the precursor solution or the precursor sol of (a) to water at a mole ratio of water:precursor $\succ$ 3, and with addition of an acid that leads to pH = 3-5, or (ii) through addition of an amount of water restricted to a mole ratio of water:precursor $\preceq$ 3 to the precursor solution or precursor sol of (a) that are to be mixed with complex-forming ligands;

(c) aging the hydrolyzed solution or sol of (b) at temperatures of $\preceq$ 50°C within 5 hours, and subsequently aging at temperatures of 80 to 98°C within 1 to 24 hours;

(d) applying the aged hydrolyzed solution or sol of (c) to a substrate;

(e) subsequently drying the applied aged solution or sol of (d) followed by calcination at temperatures between 350 and 650°C for converting the hydrolyzed precursor into a semiamorphous intermediate phase and then to transitional aluminum oxides; and

(f) performing annealing by increasing temperature to $\preceq$950°C for converting product of (e) into corundum phase,

wherein the substrate is composed of a different material from the corundum layers, and in which through sintering at a temperature of $\preceq$ 1250°C there is an average grain size of $\preceq$ 0.5 μm.

Accordingly, the rejection of claims 49 and 50 over EP '208 should also be withdrawn.

Still further, EP '208 does not teach or suggest, as recited in Applicants' claim 65, nanocorundum powder produced according to the process recited in claim 24 comprising a median value of particle size distribution $D_{50} \prec$ 100 nm.

Still further, EP '208 does not teach or suggest, as recited in Applicants' claim 66, nanocorundum powder produced according to the process recited in claim 29 comprising a median value of particle size distribution $D_{50} < 100$ nm.

Still further, EP '208 does not teach or suggest, as recited in Applicants' claim 67, nanocorundum powders produced according to the process recited in claim 24 comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles $D_{84} < 150$ nm, less than 0.05% by weight chlorine, at least 60% α-aluminum oxide, and the powders are redispersible.

Still further, EP '208 does not teach or suggest, as recited in Applicants' claim 68, nanocorundum powders produced according to the process recited in claim 29 comprising a close particle size distribution in nanometer range, comprising a narrow width of size distribution of isometrically formed particles $D_{84} < 150$ nm, less than 0.05% by weight chlorine, at least 60% α-aluminum oxide, and the powders are redispersible.

Accordingly, the rejection of these claims should also be withdrawn.

For the reasons set forth above, EP '208 does not teach or suggest Applicants' disclosed and claimed invention, whereby this ground of rejection should be withdrawn.

Rejection of claim 46 under 35 U.S.C. 103(a) as being unpatentable over Katoh, U.S. Patent No. 5,925,592

In response to the rejection of claim 46 as being obvious over Katoh, Applicants respectfully submit that claim 46 is directed to Al_2O_3 sintered product comprising a sintered mass

of the nanocorundum produced according to claim 28 and which consists essentially of Al_2O_3, wherein through annealing at 650 to 1250°C, there is a phase composition of more than 80% corundum and an average pore size of 10 - 100 nm with a porosity of ≥ 30% by volume.

Thus, amongst other features recited in Applicants' claim 46, the claim includes a phase composition of more than 80% corundum and an average pore size of 10 - 100 nm with a porosity of ≥ 30% by volume. In contrast, Katoh does not appear to disclose a porosity of ≥ 30% by volume as recited in claim 46. In this regard, as discussed with the Examiner during the above-noted interview, the values noted in the Tables of Katoh, such as Table 2 is a pore volume rate showing the percent of pores having the indicated ranges of pore diameters. Thus, the pore volume rate does not appear to be a porosity as recited in Applicants' claims.

Moreover, while Katoh does broadly disclose that the dried product can be calcined at a temperature of, say, 400 to 1,000°C in a calciner, Example 1 discloses the use of a temperature of 600°C. Accordingly, the example relied upon in the rejection should not contain any corundum which cannot be formed at such a low temperature.

In view of the above, this ground of rejection is without sufficient basis, and should be withdrawn.

CONCLUSION

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejection of record, and allow all the pending claims.

Allowance of the application is requested, with an early mailing of the Notices of Allowance and Allowability.

If the Examiner has any questions or wish to further discuss this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

Respectfully submitted,
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